10-7-1965

Test 918: Case 931 GP (Diesel)

Tractor Museum
University of Nebraska-Lincoln, TractorMuseumArchives@unl.edu

NEBRASKA TRACTOR TEST 918 - CASE 931 GP DIESEL

POWER TAKE-OFF PERFORMANCE

Hp	Crank-shaft speed rpm	Fuel Consumption Gal per hr	Fuel Consumption Lb per hp-hr	Hp-hr per gal	Temperature Degrees F Cooling medium	Temperature Degrees F Air wet bulb	Temperature Degrees F Air dry bulb	Barometer inches of Mercury
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed—Two Hours								
85.39	1800	6.278	0.509	13.60	190	55	75	29.227
Standard Power Take-off Speed (540 rpm)—One Hour								
82.87	1683	6.095	0.509	13.60	191	56	75	29.215
VARYING POWER AND FUEL CONSUMPTION—TWO HOURS								
74.80	1854	5.237	0.484	14.28	179	60	75	.....
0.00	1983	1.682	.....	.....	173	59	73	.....
38.85	1926	3.429	0.611	11.33	177	60	74	.....
85.59	1801	6.355	0.514	13.47	191	63	75	.....
19.69	1953	2.571	0.904	7.66	175	64	74	.....
57.18	1892	4.275	0.517	13.38	178	65	75	.....
Av 46.02	**1901**	**3.925**	**0.590**	**11.72**	**179**	**62**	**74**	**29.193**

DRAWBAR PERFORMANCE

Hp	Draw-bar pull lbs	Speed miles per hr	Crank-shaft speed rpm	Slip of drivers %	Fuel Consumption Gal per hr	Fuel Consumption Lb per hp-hr	Hp-hr per gal	Temp Degrees F Cool-ing med	Temp Degrees F Air wet bulb	Temp Degrees F Air dry bulb	Barom-eter inches of Mercury
VARYING DRAWBAR POWER AND FUEL CONSUMPTION WITH BALLAST											
Maximum Available Power—Two Hours—4th Gear											
72.98	6036	4.53	1799	6.73	6.216	0.589	11.74	187	55	70	28.775
75% of Pull at Maximum Power—Ten Hours—4th Gear											
60.49	4725	4.80	1867	4.84	5.023	0.575	12.04	188	47	55	28.824
50% of Pull at Maximum Power—Two Hours—4th Gear											
41.96	3145	5.00	1908	3.00	3.959	0.653	10.60	191	57	59	28.705
MAXIMUM POWER WITH BALLAST											
62.46	10054	2.33	1850	14.88	2nd Gear			180	57	73	28.960
73.07	9299	2.95	1799	12.43	3rd Gear			183	47	56	28.960
76.00	6273	4.54	1804	6.80	4th Gear			185	52	66	28.900
73.16	4843	5.66	1804	5.18	5th Gear			183	52	66	28.900
74.51	3452	8.09	1802	3.71	6th Gear			178	52	66	28.900
73.10	2663	10.29	1801	2.81	7th Gear			177	52	66	28.900
MAXIMUM POWER WITHOUT BALLAST											
74.53	6318	4.42	1800	9.23	4th Gear			182	62	63	28.820

VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST—4th Gear

Pounds pull	6273	6564	6811	6965	7082	6934
Horsepower	76.00	71.45	65.36	58.08	50.45	41.16
Crankshaft speed, rpm	1804	1627	1440	1254	1075	893
Miles per hour	4.54	4.08	3.60	3.13	2.67	2.23
Slip of drivers, %	6.80	7.29	7.70	7.70	8.24	7.97

TIRES, BALLAST and WEIGHT		**With Ballast**	**Without Ballast**
Rear tires	—No, size, ply & psi	Two 18.4-34; 8; 20	Two 18.4-34; 8; 16
Ballast	—Liquid	1110 lb each	None
	Cast iron	1015 lb each	None
Front tires	—No, size, ply & psi	Two 7.50-15; 6; 36	Two 7.50-15; 6; 36
Ballast	—Liquid	None	None
	Cast iron	38 lb each	None
Height of drawbar		17 inches	17 inches
Static weight	—Rear	10690 lb	6440 lb
	Front	2375 lb	2300 lb
Total weight with operator		13240 lb	8915 lb

Department of Agricultural Engineering

Dates of Test: OCTOBER 7 TO OCTOBER 16, 1965

Manufacturer: J. I. CASE COMPANY, RACINE, WISCONSIN

FUEL, OIL and TIME Fuel No 2 diesel **Cetane No** 57.0 (rating taken from oil company's typical inspection data) **Specific gravity converted to 60°/60°** 0.8312 **Weight per gallon** 6.920 lb **Oil** SAE 20-20W **API service classification** MS, DS **To motor** 3.681 gal **Drained from motor** 2.671 gal **Transmission and final-drive lubricant** SAE 10W **Type** Case TCH oil **Total time engine was operated** 44 hours.

ENGINE Make Case diesel **Type** 6 cylinder vertical **Serial No** 2101218 **Crankshaft mounted** lengthwise **Rated rpm** 1800 **Bore and stroke** 4⅛" x 5" **Compression ratio** 15.2 to 1 **Displacement** 401 cu in **Cranking system** 12 volt electric (two 6 volt batteries) **Lubrication** pressure **Air cleaner** oil washed wire mesh **Oil filter** replaceable pleated paper element **Fuel filter** two replaceable cotton elements and one replaceable pleated paper cartridge **Muffler** was used **Cooling medium temperature control** thermostat.

CHASSIS Type standard **Serial No** 8254627 **Tread width** rear 64" to 96" front 53¾" to 83⅜" **Wheel base** 108" **Center of gravity** (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from centerline of rear wheels 28.2" Vertical distance above roadway 37.1" Horizontal distance from center of rear wheel tread 0" to the right/left **Hydraulic control system** direct engine drive **Transmission** selective gear fixed ratio **Advertised speeds mph** first 1.8 second 2.6 third 3.2 fourth 4.7 fifth 5.7 sixth 8.1 seventh 10.2 eighth 14.7 reverse 2.3 and 7.3 **Clutch** single plate dry disc operated by foot pedal **Brakes** double disc operated by two foot pedals which can be locked together **Steering** mechanical with power assist **Turning radius** (on concrete surface with brake applied) right 130" left 130" (on concrete surface without brake) right 157" left 157" **Turning space diameter** (on concrete surface with brake applied) right 265" left 265" (on concrete surface without brake) right 321" left 321" **Belt pulley** 920 rpm at 1700 engine rpm diam 10½" face 7¼" Belt speed 2523 fpm **Power take-off** 545 rpm at 1700 engine rpm (1000 rpm Power Take-off is also available).

REPAIRS and ADJUSTMENTS No repairs or adjustments.

REMARKS All test results were determined from observed data obtained in accordance with the SAE and ASAE test code.

First gear was not run as it was necessary to limit the pull in second gear to avoid excessive wheel slippage. Eighth gear was not run as it exceeded 15 mph.

We, the undersigned, certify that this is a true and correct report of official Tractor Test 918.

L. F. LARSEN
Engineer-in-Charge

G. W. STEINBRUEGGE, Chairman
J. J. SULEK
D. E. LANE
Board of Tractor Test Engineers

The University of Nebraska Agricultural Experiment Station
E. F. Frolik, Dean; H. H. Kramer, Director, Lincoln, Nebraska

EXPLANATION OF TEST REPORT

GENERAL CONDITIONS

Each tractor is a production model equipped for common usage. Power consuming accessories can be disconnected only when it is convenient for the operator to do so in practice. Additional weight can be added as ballast if the manufacturer regularly supplies it for sale. The static tire loads and the inflation pressures must conform to recommendations in the Tire Standards published by the Society of Automotive Engineers.

PREPARATION FOR PERFORMANCE RUNS

The engine crankcase is drained and refilled with a measured amount of new oil conforming to specifications in the operators manual. The fuel used and the maintenance operations must also conform to the published information delivered with the tractor. The tractor is then limbered-up for 12 hours on drawbar work in accordance with the manufacturer's published recommendations. The manufacturer's representative is present to make appropriate decisions regarding mechanical adjustments.

The tractor is equipped with approximately the amount of added ballast that is used during maximum drawbar tests. The tire tread-bar height must be at least 65% of new tread height prior to the maximum power run.

BELT OR POWER TAKE-OFF PERFORMANCE

Maximum Power and Fuel Consumption. The manufacturer's representaitve makes carburetor, fuel pump, ignition and governor control settings which remain unchanged throughout all subsequent runs. The governor and the manually operated governor control lever is set to provide the high-idle speed specified by the manufacturer for maximum power. Maximum power is measured by connecting the belt pulley or the power take-off to a dynamometer. The dynamometer load is then gradually increased until the engine is operating at the rated speed specified by the manufacturer for maximum power. The corresponding fuel consumption is measured.

Varying Power and Fuel Consumption. Six different horsepower levels are used to show corresponding fuel consumption rates and how the governor causes the engine to react to the following changes in dynamometer load: 85% of the dynamometer torque at maximum power; minimum dynamometer torque, ½ of the 85% torque; maximum power, ¼ and ¾ of the 85% torque. Since a tractor is generally subjected to varying loads the average of the results in this test serve well for predicting the fuel consumption of a tractor in general usage.

DRAWBAR PERFORMANCE

All engine adjustments are the same as those used in the belt or power take-off tests. If the manufacturer specifies a different rated crankshaft speed for drawbar operations, then the position of the manually operated governor control is changed to provide the high-idle speed specified by the manufacturer in the operating instructions.

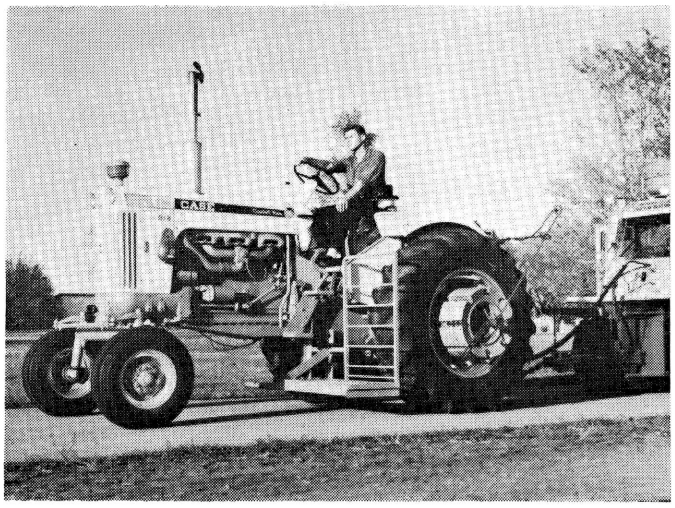
Varying Power and Fuel Consumption With Ballast. The varying power runs are made to show the effect of speed-control devices (engine, governor, automatic transmission, etc.) on horsepower, speed and fuel consumption. These runs are made around the entire test course which has two 180 degree turns with a minimum radius of 50 feet. The drawbar pull is set at 3 different levels as follows: (1) as near to the pull at maximum power as possible and still have the tractor maintain the travel speed at maximum horsepower on the straight sections of the test course; (2) 75% of the pull at maximum power; and (3) 50% of the pull at maximum power. Prior to 1958, fuel consumption data (10 hour test) were shown only for the pull obtained at maximum power for tractors having torque converters and at 75% of the pull obtained at maximum power for gear-type tractors.

Maximum Power with Ballast. Maximum power is measured on straight level sections of the test course. Data are shown for not more than 12 different gears or travel speeds. Some gears or travel speeds may be omitted because of high slippage of the traction members or because the travel speed may exceed the safe-limit for the test course. The maximum safe speed for the Nebraska Test Course has been set at 15 miles per hour. The slippage limits have been set at 15% and 7% for pneumatic tires and steel tracks or lugs, respectively. Higher slippage gives widely varying results.

Maximum Power Without Ballast. All added ballast is removed from the tractor. The maximum drawbar power of the tractor is determined by the same procedure used for getting maximum power with ballast. The gear (or travel speed) is the same as that used in the 10-hour test.

Varying Power and Travel Speed with Ballast. Travel speeds corresponding to drawbar pulls beyond the maximum power range are obtained to show the "lugging ability" of the tractor. The run starts with the pull at maximum power; then additional drawbar pull is applied to cause decreasing speeds. The run is ended by one of three conditions: (1) maximum pull is obtained, (2) the maximum slippage limit is reached, or (3) some other operating limit is reached.

For additional information about the **Nebraska Tractor Tests** write to the **Department of Agricultural Engineering, University of Nebraska, Lincoln, Nebraska.**



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